MOUPIYA MAJI

Pune, Maharashtra, Pin - 411007
Website: https://moupiyamaji.netlify.app
Email: moupiyamaji137@gmail.com
Phone: +91 74508 96697

SUMMARY

I am an astrophysicist and astronomy education researcher with a multidisciplinary background that bridges fundamental astrophysical research and science education. My academic trajectory spans computational studies of the early universe, galaxy evolution, and stellar physics, as well as empirical research in science pedagogy, including a nationwide survey assessing astronomy knowledge and attitudes among school students in India. I am strongly committed to advancing evidence-based teaching practices and have led multiple teacher training workshops and mentoring initiatives. My work is grounded in a broader vision of inclusive and effective science education, and I remain actively engaged in public outreach and science communication to promote scientific literacy.

EDUCATION

The Pennsylvania State University, University Park, PA, USA
Ph.D. in Astronomy and Astrophysics *2018*
M.S. in Astronomy and Astrophysics *2014*

Indian Institute of Science, Bangalore, India
M.S. in Physics, First class with Distinction *2012*

Presidency College, Calcutta University, Kolkata, India
B.S. in Physics, First class with Honors *2009*

RESEARCH EXPERIENCE

IAU - Office of Astronomy for Education (OAE) Center India
- Postdoctoral Research – *Astronomy Education* 2022 - now

- Designed and led a nationwide, multilingual survey study on the status of astronomy education among 2000 secondary school students across 11 Indian states.
- Developed the 16-item instrument addressing conceptual understanding, curriculum alignment, cultural relevance, resource exposure, and student aspirations regarding astronomy.
- Led the data analysis process — developed coding schemes, supervised digitization, and conducted statistical analysis to identify learning gaps and systemic inequities.
- Findings revealed widespread conceptual gaps, limited access to resources, lack of career guidance, and notable disparities along socioeconomic backgrounds, despite high student interest in astronomy.
- Developed and administered a complementary 10-question teacher survey, conducting interviews to capture educator perspectives and actionable recommendations.
- Research outcomes contribute to curriculum development, equity-centered interventions, and targeted teacher training programs.

Université de Genève - PostDoctoral Research – *Reionization Era* 2018 - 2021

- Performed 3D radiative transfer simulations of Lyman-alpha photons for thousands of galaxies in the hydrodynamical cosmological simulation *SPHINX* using the RASCAS code.
- Developed predictive models using multivariate regression to estimate a galaxy's contribution to reionization from observable properties, informing strategies for future observational missions.
- Demonstrated that bright Lyman-alpha emitters are likely the primary sources of hydrogen reionization in the early universe.

The Pennsylvania State University - Ph.D. Research – *Galaxies and Star clusters* 2012 - 2018

- Analyzed Milky Way satellite galaxy data to assess the impact of observational undersampling on the apparent anisotropy and kinematic coherence of satellite planes; demonstrated that hydrodynamical simulations can reproduce such anisotropic distributions.
- Studied the origin of the universal log-normal mass function in globular clusters by performing major galaxy merger simulations; showed that extreme high pressure clouds in highly shocked regions of mergers can produce massive star clusters with log-normal mass function which may evolve into globular clusters observed today.

Indian Institute of Science - Masters Thesis – *Warped galaxies* 2011 - 2012

- Developed theoretical models to determine the pattern speed of warped spiral galaxies and reconstruct their 3D velocity fields using observed surface brightness and line-of-sight velocity data; validated the method on numerically simulated galaxies.

Saha Institute of Nuclear Physics - Undergraduate Research Associate – *High energy physics* 2009

- Analyzed 2009 ALICE detector data from the Large Hadron Collider to evaluate the electronic stability of MANAS readout chips; confirmed data integrity with noise levels well below the accepted threshold and no detectable signal deformation.

PUBLICATIONS

First author publications

1. **Maji, M.**, More, S., Sule, A., et al. *"Status of Astronomy Education in India: A Baseline Survey"*, 2025, under review in AEJ (Astronomy Education Journal)
2. **Maji, M.**, More, S., Sule, A. *"Status of Astronomy Education in India: A Baseline Survey (Statewise Analysis)"*, 2025, epiSTEME-10 conference proceedings, https://episteme10.hbcse.tifr.res.in/docs/epiSTEME-Extended-Abstracts-2025.pdf
3. **Maji, M.**, Verhamme, A., Garel, T., Blaizot, J., Roshdahl, J., Chuniaud, M., Michel-Dansac, L., Mauerhofer, V., Pittavino, M., Feser, M. *"Can we predict LyC emission of galaxies using their physical and Lymam alpha emission properties?"*, 2022, A&A, (Astronomy and Astrophysics Journal)
4. **Maji, M.**, Zhu, Q., Marinacci, F. & Li, Y. *"Is There a Disk of Satellites around the Milky Way?"*, 2017, ApJ, 843, 62. (The Astrophysical Journal)
5. **Maji, M.**, Zhu, Li, Y., Charlton, J., Hernquist, L. & Knebe, A. *"The Formation and Evolution of Star Clusters in Interacting Galaxies"*, 2017, ApJ, 844, 108. (The Astrophysical Journal)

Co-authored publications

1. Sule, A., Ramanujam, N. M., **Maji, M.**, More, S., Yadav, V., Narayanan, A., Dhurde, S., Ganguly, J., Seetha, S., Srivastava, A. M., Shylaja, B. S., Wadadekar, Y. *"Astronomy and society: The road ahead"*, 2025, JAA, 46, 1,(Journal of Astrophysics and Astronomy)
2. Rodruck, M., Charlton, J., Borthakur, S., Chitre, A., Durrell, P. R., Elmegreen, D., English, J., Gallagher, S. C., Gronwall, C., Knierman, K., Konstantopoulos, I., Li, Y., **Maji, M.**, Mullan, B., Trancho, G., Vacca, W., 2023, *"Star clusters in tidal debris"*, 2023, MNRAS, 526,2. (Monthly Notices of the Royal Astronomical Society Journal)
3. Zhu, Q., Li, Y., Li, Yi., **Maji, M.**, Yajima, H., ; Schneider, R., Hernquist, L. *"The Formation of the First Quasars. I. The Black Hole Seeds, Accretion and Feedback Models"*, 2021, MNRAS (Monthly Notices of the Royal Astronomical Society Journal)

4. Li, Y., Gu, M., Yajima, H., Zhu, Q., **Maji, M.** *"ART^2: a 3D parallel multiwavelength radiative transfer code for continuum and atomic and molecular lines "*, 2020, MNRAS, 494, 1919. (Monthly Notices of the Royal Astronomical Society)

5. Zhu, Q., Marinacci, F., **Maji, M.**, Li, Y., Springel, V. & Hernquist, L. *"Baryonic impact on the dark matter distribution in Milky Way-sized galaxies and their satellites"*, 2016, MNRAS, 458, 1559.(Monthly Notices of the Royal Astronomical Society)

Manuscripts in preparation

1. **Maji, M.** *"Measuring Knowledge Gains and Perceptions in Astronomy: Insights from a Teacher Training Intervention"*, in prep

2. **Maji, M.** *"Public Understanding of Astronomy and Astrology: Findings from a Two-Year Survey at a National Science Outreach Event in India"*, in prep

3. Singhal, A., **Maji, M.**, et al. *"Teachers' Perception on Astronomy Curriculum of 9th Grade in India: A Baseline Survey"* in prep

GRANTS AND AWARDS

Co-I of the international JWST grant to "LyC22 - Deep spectroscopic insights on star-forming galaxies 2.2 Gyr after the Big Bang" James Webb Space Telescope (JWST) Cycle 1 proposal 2021
Research Travel Grant, Société Académique de Geneve, University of Geneva 2020
Co-I of international HST grant to "Star Clusters in Tidal Debris: A UV Survey of Stellar Populations, Galaxy Interactions, and Evolution" Hubble Space Telescope (HST) 2017
Zaccheus Daniel Fellowship, The Pennsylvania State University 2016, 2014
Homer F. Braddock and Nellie H. and Oscar L. Roberts Fellowships, PennState 2012
Junior Research Fellowship (JRF) from National Eligibility Test (NET), nationally ranked 36th 2011
Young Researcher Lindau Travel Award, to attend Lindau Nobel Laureates Meetings, India 2010

TEACHING EXPERIENCE

Instructor Introductory Astronomy lab 2018, 2017, 2013, 2012
Taught the course on practical astronomy lab to undergraduate students ($\sim$ 25 in each class) for 4 semesters. The course objective was to understand astronomy concepts using computer softwares, workbooks, presentations and observations through telescopes and planetarium. Developed the curriculum, taught class weekly, guided them through nighttime telescope observations, and graded the course.

Telescope & **Planetarium Operator** Observational component of various courses 2018
Guided undergraduate students through telescope observations and delivered planetarium lectures few nights every week.

Teaching Assistant Astronomical Universe 2017, 2012
Teaching Assistant Life in the Universe 2013
Graded these undergraduate courses, and held regular office hours for students.

Guest Lecturer Stars and Galaxies, 2013
Guest Lecturer Stars, Galaxies, and the Universe 2012

ADVISING

- Mentored two groups of school students (3 each) during summer research programs (2023, 2024), guiding them through projects on exoplanet habitability; introduced astronomy software and data tools, and supported them in developing and presenting their findings.
- Mentored two Masters Students for their semester long projects. Conceptualized the problems, generated the dataset for analysis by performing radiative transfer simulations and helped them with running simulations and statistical analysis.
  Origin of extended lyman alpha emission - Will Ceva (Masters student, UniGe) 2021
  Investigated the origin of extended Lyman alpha emission (Lya Halos) that is often observed in galaxies at early universe, especially around reionization by analyzing 50 simulated galaxies.

  How lyman alpha emitters work - Jaime Roman Garza (Masters student, UniGe) 2020
  Researched the impact of the inter-stellar medium (ISM) structure (covering fraction, column density etc) on the escape of the Lyman-alpha radiation from early galaxies.

TEACHER TRAINING ACTIVITIES

- **Workshop Organizer and Instructor**, Teacher Training Workshop, OAE India (February 2024)
  Organized and coordinated a two-day training workshop for 46 school teachers (grades 5–10), selected from over 200 applicants. Designed and delivered interactive sessions on lunar phases and cosmic scales; led sky-watching activity, designed pre/post-workshop survey questionnaire, and analyzed the data to assess workshop impact.
- **Instructor**, Teacher Training Program by SciPop IUCAA (February 2023, February 2024, August 2024)
  Delivered interactive sessions for $\sim$ 120 school teachers across three workshops. Topics included Reasons for Seasons (Feb 2023), Moon Phases (Feb 2024), and The Science of Stars (Aug 2024), incorporating lectures, hands-on demonstrations, and the development of teaching resources addressing common misconceptions.
- **Instructor**, Teacher Training Workshop, Kolkata, Dec 2023
  Delivered a session for $\sim$ 30 school teachers on integrating astronomy into science lessons to enhance conceptual understanding and student engagement.
- **Guest Lecturer**, Maharashtra State Faculty Development Academy, January and September 2024
  Delivered two lectures to college teachers: Evolution of Stars (Jan 2024) and Exoplanets (Sep 2024), focusing on current research and pedagogical approaches in astronomy.
- **Evaluation tools developer**, Developed and analyzed pre- and post-workshop surveys for the IUCAA and LIGO-India Teacher Training Workshop with 47 teachers; assessed the impact of LIGO's children's science book distributed to 500 students; created evaluation tools for various SciPop workshops to measure educational impact and engagement.

PROFESSIONAL SERVICES

- **Reviewer**, IAU OAE Teacher Training Program (TTP) Grant Competition (2023, 2024)
  Evaluated international proposals for astronomy teacher training workshops in various countries.
- **Scientific Organizing Committee Member**, 6th Shaw–IAU Workshop on Astronomy for Education (November 2024)
  Reviewed and selected abstracts for session on astronomy education research (AER).
- **Peer Reviewer** for journals including *Nature* and *The Astrophysical Journal (ApJ)*

SCIENTIFIC SKILLS

Programming languages:	R, Python, C++, C, IDL, Fortran, Julia
Operating systems:	Unix/Linux, Macintosh OS X
Architecture:	Cluster computing, Parallel computing, GPU computing
Editing:	Adobe AfterEffects, Adobe Illustrator

TALKS AND POSTERS

Talks

Status of Astronomy Education in India: A Baseline Survey (Statewise Analysis)	epiSTEME-10 conference, HBCSE, Mumbai	Jan 2025
Status of Astronomy Education in India: A Baseline Survey	IAU General Assembly, Cape Town	Aug 2024
Status of Astronomy Education in India: A Baseline Survey	ASI Conference, Bangalore	Feb 2024
Baseline Survey of Astronomy Education in India	Shaw-IAU workshop on Astronomy for Education, online	Nov 2023
Baseline Survey of Astronomy Education in India: Pilot Study	ASI Conference, Indore	Mar 2023
Predicting the Sources of Cosmic Reionization	Data Science Day, University of Geneva (invited)	Sep 2021
Predicting Reionization Sources Using Lyman Alpha	SPHINX-RASCAS TRIPLE Workshop	Feb 2021
Understanding Cosmic Reionization Using Lyman Alpha Emission	SAZERAC Conference (online)	Jul 2020
Understanding Cosmic Reionization Using Lyman Alpha Line	Zoom-In and Out, NORDITA, Stockholm	Jun 2019
Radiative Transfer of Lyα Emission from High-Redshift Quasars Using ART2 Code	Walking the Line, Arizona State University	Mar 2018
Illuminating Star Clusters and Satellite Galaxies with Multi-Scale Baryonic Simulations	231st AAS Meeting, Washington DC	Jan 2018
Dwarf Galaxies Around the Milky Way – Disk of Satellites	Neighborhood Workshop, Penn State	Mar 2015
The Formation and Evolution of Star Clusters in Galaxy Mergers	224th AAS Meeting, Boston	Jun 2014

Posters

Multi Wavelength properties of first quasars and early galaxies	Spectral diagnostics to explore the cosmic dawn with JWST, STSCI, Baltimore	Aug 2017
Star formation history and evolution of local group dwarfs	Mocking the Universe, STSCI, Baltimore	Jul 2015
Formation and evolution of Disk of Satellites	Local Group Astro-Statistics, University of Michigan, Ann Arbor	Jun 2015

PUBLIC OUTREACH

National Science Day event at IUCAA – *Volunteer* 2023, 2024

Delivered public talks; designed and conducted a public survey on astronomy and astrology awareness; trained and coordinated new volunteers, and supported event logistics at a major outreach program attended by 7,000–8,000 visitors.

City Wide exhibition by U. Geneva Observatory – *Volunteer* 2018

Volunteered in a major city-wide public exhibition organized by the University of Geneva Astronomy department; made educational posters and presented them to groups of visitors.

Graduate Women in Science PennState Chapter – *Outreach Organizer* 2014 - 2016

Organized monthly outreach and science education events for the general public and school students at different community locations and facilitated hands-on activities and science demonstrations; organized monthly seminars for graduate students focusing on professional development, selected and coordinated with speakers from the campus faculty and career services.

AstroFest in Penn State Astronomy Department – *Volunteer* 2013 - 2018

Volunteered in a major yearly four day astronomy outreach event organized by Penn State Astronomy department. Delivered public talks on astronomy topics to groups of visitors.

Indian Institute of Science Open Day – *Astronomer Volunteer* 2011 - 2012

Organized yearly public outreach event for the astronomy section of the physics department in the institute. Demonstrated science experiments and gave short informal talks to the public.

SCIENCE COMMUNICATION

Public talks

Life in cosmos	National Space Day, IIIT Pune	Aug 2024
Exoplanets	AXSX (online talk)	Apr 2024
Are we alone in the Universe?	National Science Day, IUCAA	Feb 2024
Story of the black holes	Monthly Lecture Series, IUCAA	Sep 2023
Reasons for Seasons	National Science Day, IUCAA	Feb 2023

Popular Science articles

- Moupiya Maji, 'The Stardust in Us', 5th issue of STEM Dorado Science magazine, pages 29-30, Oct 2024
- Moupiya Maji, 'Exoplanets- how astronomers discover new worlds', Club SciWri - Scientists Simplifying Science, May 2025

PERSONAL INTERESTS AND HOBBIES

Passionate about effective science communication; enjoy creating astronomy-themed YouTube videos for general audiences in both Bengali and English.

Avid fiction reader. Enthusiastic gardener. Amateur photographer.